



Reduce Your Flood Risk:

A Resource Guide



Flood Control District of Maricopa County

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Table of Contents

INTRODUCTION

A. Purpose of the Resource Guide	4
B. About the Flood Control District	4
C. What we do	4
D. Helpful contacts.....	5

UNDERSTAND YOUR FLOOD RISK

A. What is a floodplain?	6
B. Understanding floodplain map terminology	6
C. How are floodplains mapped?	7
D. Why do floodplain maps change?	7
E. How are floodplain maps used?	7
F. Flood risk zones	8
G. Am I in a mapped floodplain?	9
H. Why should I care?	9
I. How to request an official floodplain determination.....	10
J. Challenging or revising a floodplain determination	11

REDUCE YOUR FLOOD RISK

Flood Insurance

A. Why do I need it?	12
B. What does it cover?	12
C. How much does it cost?	13
D. How do I purchase it?	13

Maintenance Responsibilities for Flood Control and Drainage Infrastructure

A. The importance of flood control and drainage structures	13
B. Who is responsible for maintaining drainage facilities in my neighborhood?	14
C. How do I find out if I have a drainage easement on my property?	14

Maintain Drainage

A. How do I tell if I have a potential drainage or flooding problem?	14
B. Wash or drainage easements	15
C. Block walls and fences	17
D. Driveways.....	17
E. Constructing drainage features	17
F. On-lot retention	18

Flood Risk Prevention Tips

A. Flood proofing your property	18
B. Erosion protection	19
C. Hiring an engineer to evaluate drainage or flooding issues	20



Flood Safety – Protect Yourself and Your Property

A. Before a flood.....	21
B. During a flood.....	21
C. After a flood.....	21
D. Emergency information	21
E. Roadway safety.....	22

MANAGING FLOOD RISK IN YOUR COMMUNITY

Roles & Responsibilities of Floodplain Management

A. Federal.....	23
B. State of Arizona.....	23
C. County.....	23
D. Local municipalities	23
E. Property owners and homeowners' associations.....	23

Managing Local Floodplains

A. Floodplain management ordinances and plans	24
B. Who is responsible for floodplain management in my area?	24

Regulating Development and Property Improvements in a Floodplain

A. Why it's important.....	25
B. Potential impacts of development and other activities in the floodplain	26

Do's & Don'ts of Floodplain Uses

A. What are the building restrictions in a floodplain?.....	27
B. When do I need a permit?	27
C. What home improvements can I make without a permit?	28
D. Obtaining permits and inspections	28
E. What are the restrictions on building on a flood-prone lot.....	28
F. More information	28

Floodplain Violations – Enforcement and Reporting

A. Reporting floodplain violations	29
B. Who to call in your area	29

SOURCES

30



Reduce Your Flood Risk: A Resource Guide

Purpose of the Resource Guide

The Flood Control District of Maricopa County (FCD) has developed this resource guide to help address commonly-asked questions about flood hazards and floodplain management. Multiple towns, cities and agencies may be responsible for addressing local drainage and flood problems, and regulating development in floodplains. It can be confusing for the public to understand who to contact to answer questions and concerns. This guide will help direct you to the right organization for your particular situation. In addition, the guide provides information about flood risk and steps residents can take to reduce their risk.

About the Flood Control District

The FCD was created in 1959 to reduce the risk of flooding to people and property. Since its formation, the FCD has built many regional flood control structures that have greatly reduced flooding impacts to County residents. The FCD currently owns and maintains 22 dams, more than 60 structures (levees, drains, etc.), 370 acres of basins and 122 miles of channels throughout the County.

Structural flood control measures are just one of many strategies to reduce flood risk to the community. The FCD also works with local municipalities and community members throughout the County to identify flooding hazards and risks. The FCD places a strong emphasis on education to inform citizens how to avoid flood hazards and minimize their flood risk. The FCD and its local municipal partners also help manage and enforce activities in floodplains and along washes and drainage systems to minimize adverse impacts to residents or waterways.

Continued collaboration with citizens, municipalities, agencies and developers is vital to ensuring that people and property remain safe from floods as the County continues to grow.

What We Do

- Identify and map floodplains.
- Conduct flood hazard studies to identify risks of flooding and potential mitigation options.
- Build and maintain structures based on flood risk priorities and available funding.
- Issue and enforce permits for development in floodplains.
- Operate a flood warning system in coordination with local emergency responders.
- Coordinate with local municipalities on regional flood hazard studies and regional flood control projects.
- Preserve the function of floodplains to convey flood flows.



Helpful Contacts

Flood Control District of Maricopa County

If you own a property or business in unincorporated Maricopa County or one of the following jurisdictions: Buckeye, Carefree, Cave Creek, Chandler, El Mirage, Gila Bend, Guadalupe, Litchfield Park, Mesa, Queen Creek, Surprise, Tolleson, Wickenburg, and Youngtown, and need general information or assistance with a drainage, flooding, floodplain or permitting item, contact:

General information/main number	602-506-1501
Report an issue with operations / maintenance of flood control structure	602-506-1501
Public information	602-506-6762
Flooding issues	602-506-2419
Drainage complaints	602-506-3301
Floodplain information, determination, permits, violations	602-506-2419
Citizen advocate – assistance with unresolved concerns	602-506-4695
Website	www.fcd.maricopa.gov

Maricopa County Department of Transportation (MCDOT)

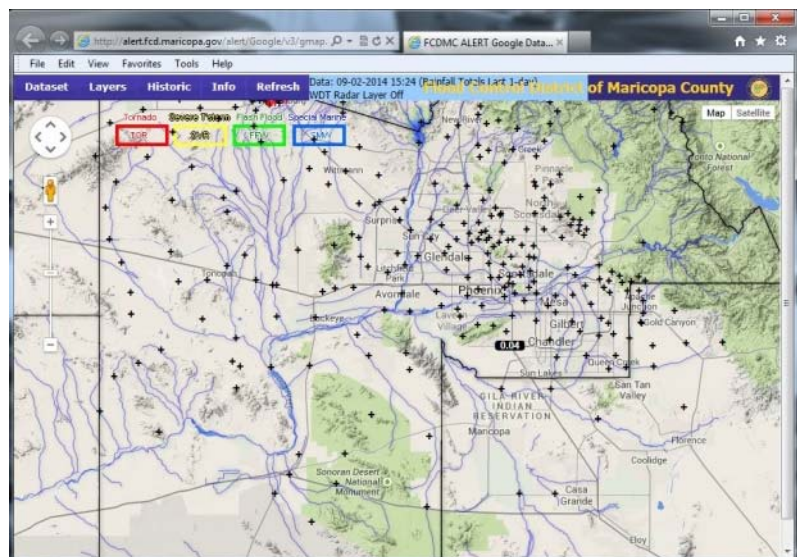
For information about County-owned roads, to report flooding or other hazards on County roads, or to see the locations of road closures in Maricopa County contact:

General information/main number	602-506-8600
Report road hazards	602-506-6063
Road closure information	www.mcdot.maricopa.gov (services)

Flood Monitoring and Reporting

Real-time rainfall and stream flow data	http://alert.fcd.maricopa.gov/alert/google/v3/gmap.html
Arizona flood warning system	www.afws2.org
Maricopa County Emergency Management	www.maricopa.gov/emerg_mgt
National Weather Service	www.nws.noaa.gov
View or submit photos of flooding in your neighborhood	www.reportaflood.org

Go online to view real-time rainfall and stream flow information on the FCD's ALERT system web page.





Understand Your Flood Risk

Flooding can occur anywhere in Maricopa County. However, some areas are at a higher flood risk than other areas. These areas are known as floodplains. Knowing your flood risk can help you decide what preventive actions to take.

What is a floodplain?

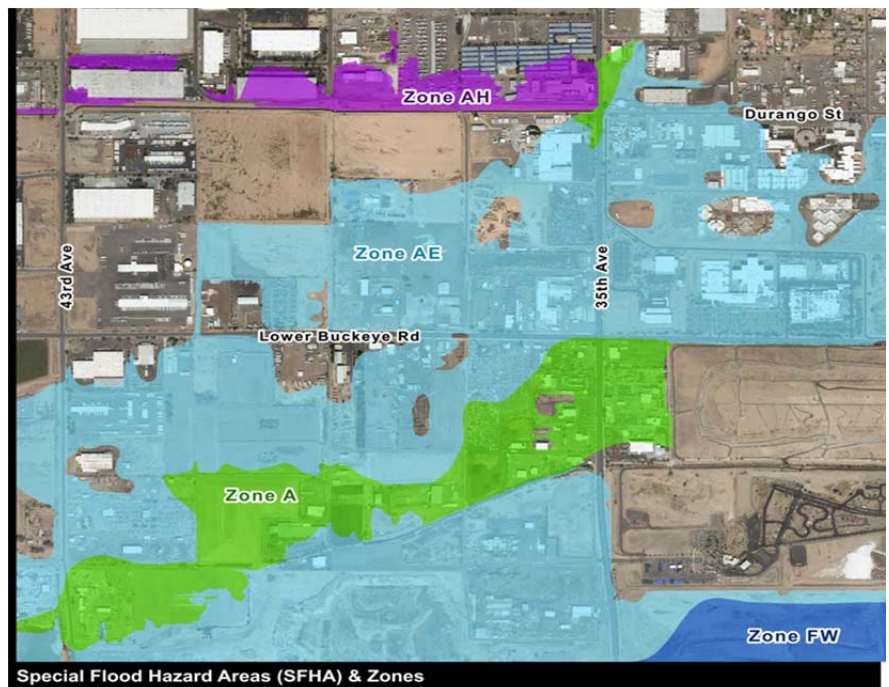
Flooding is a natural process that shapes river channels and adjacent lands. Floodplains occur next to washes, rivers, wetlands, lakes, coastal areas, and sometimes man-made features such as canals, berms, or roads. Flooding occurs when runoff from rain doesn't soak into the ground or evaporates and collects or flows in low lying areas.

- ▶ A **floodplain** is any area where water gathers during a flood and is present regardless of whether it is identified on a map or not.

In undeveloped areas, flooding and floodplains provide many positive benefits. When development happens in a floodplain, properties and people can be impacted.

Understanding Floodplain Map Terminology

- **Base Flood** - A flood that has a one percent chance to be equaled or exceeded in any year (also referred to as the "100-year flood").
- **Floodplain** - Any land area prone to flooding from any source.
- **Floodway (FW)** - The channel of a river, wash or other watercourse and the adjacent land areas that actively carries stormwater flows downstream.
- **Flood Insurance Rate Map (FIRM)** - The official FEMA map showing 100-year floodplains and National Flood Insurance Program (NFIP) flood zones.
- **Special Flood Hazard Area (SFHA)** - Land subject to flooding during a base flood where flood hazards are high. This area is where the community's floodplain regulations are enforced and flood insurance is required for mortgage holders.
- **Zones** - Letter designations



Example of a Flood Insurance Rate Map, which uses letter zones to indicate the level of flood risk in an area.



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that indicate the different types of flood risk or Special Flood Hazard Areas for specific areas. Examples include A, AE, AO, AH, FW and X.

How are floodplains mapped?

There are thousands of miles of floodplains in Maricopa County. Because of the large number of floodplains in the County, not all are currently mapped. Every year, the Flood Control District of Maricopa County (FCD) develops new or updated floodplain maps in areas where the floodplains haven't been mapped or where they may have changed and need updating. This mapping update is known as a floodplain delineation study. Floodplain delineation involves development of detailed topographic maps to determine where water flows, how deep it is and how swiftly it flows. Along with extensive surveying and aerial mapping, drainage factors such as slope, vegetation, soil composition, and land use are also used to determine areas prone to flooding.

Delineation studies are used by the FCD and its municipal partners to better manage the floodplain and reduce or prevent flood damage. These studies are also used by FEMA to update the nation's Flood Insurance Rate Maps (FIRMs) for the National Flood Insurance Program (NFIP), which identify the regulatory floodplain and the levels of flood risk to individual properties.

- The **regulatory floodplain** is any mapped area in or near a river, wash, stream or other watercourse or other feature that is inundated by water resulting from a 100-year storm event.

Why do floodplain maps change?

Changing weather patterns, erosion and land development can affect stormwater flow and the areas subject to flooding. In addition, floodplain maps may change because of updated tools and changing FEMA requirements. For these reasons, the FCD periodically updates floodplain maps in watersheds throughout Maricopa County.

How are floodplain maps used?

Flood Insurance Rate Maps (FIRMs) are the basis for floodplain management, flood hazard mitigation and insurance ratings. The FIRM is the official map on which FEMA has delineated both the 100-year

100-Year Floods: An Important Measure of Flood Risk

A flood that has a one percent chance of occurrence in any given year is known as the 100-year flood. FEMA refers to this as the "base flood".

The term "100-year flood" is commonly misinterpreted to mean "once every 100 years," which is misleading. An area can experience a 100-year flood several times in the same year or not have one for 200 years. Almost every year someplace in Maricopa County experiences a 100-year flood.

The 100-year flood is an important measure of flood risk because it is the national standard used to identify floodplains, require purchase of flood insurance, determine the need for any man-made flood control structures, and regulate floodplains.

Generally a 100-year storm event in Maricopa County is the equivalent of approximately 4 inches of rainfall in a 24-hour period, depending on the location.

While the 100-year storm provides a benchmark to measure flood hazards, it is important to note flood hazards occur for more and less frequent storms than the 100-year event.



Reduce Your Flood Risk: A Resource Guide

floodplain and the National Flood Insurance Program (NFIP) flood zone, which help determine the cost of flood insurance. Flood Insurance Rate Maps (FIRMs) depict the designated flood risk for properties as high risk, moderate-to-low risk and undetermined and provide corresponding letter designations to indicate an area's level of flood risk. The lower the degree of risk is to a property, the lower the flood insurance premium will be. If your property is located in a FEMA floodplain and you have a federally-backed mortgage, your lending institution will require you to purchase flood insurance.

Flood Risk Zones

Flood Insurance Rate Maps use letters to designate the level of risk to properties in an area.

- **High Risk**

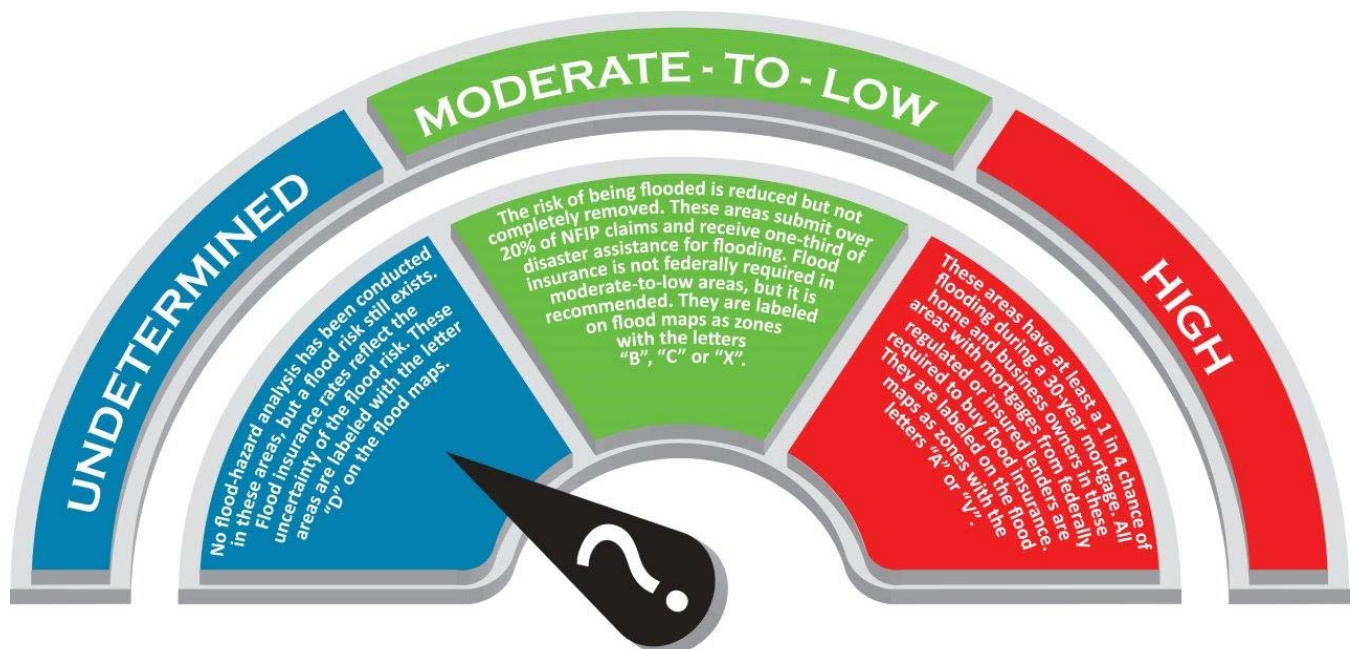
Zones A and V are the highest risk areas. Residential and commercial properties in these areas have a one in four chance of flooding during a 30-year mortgage. Owners of properties in these zones are required to carry flood insurance if they have a federally-insured mortgage.

- **Moderate-to-Low Risk**

In these areas, the risk of flooding is reduced but not completely removed. These are identified as zones B, C or X. Property owners located in these areas submit 20 percent of all flood insurance claims.

- **Undetermined**

In these areas an analysis of the flood risk has not been conducted and an undetermined level of flood risk exists. These areas are identified as zone D.





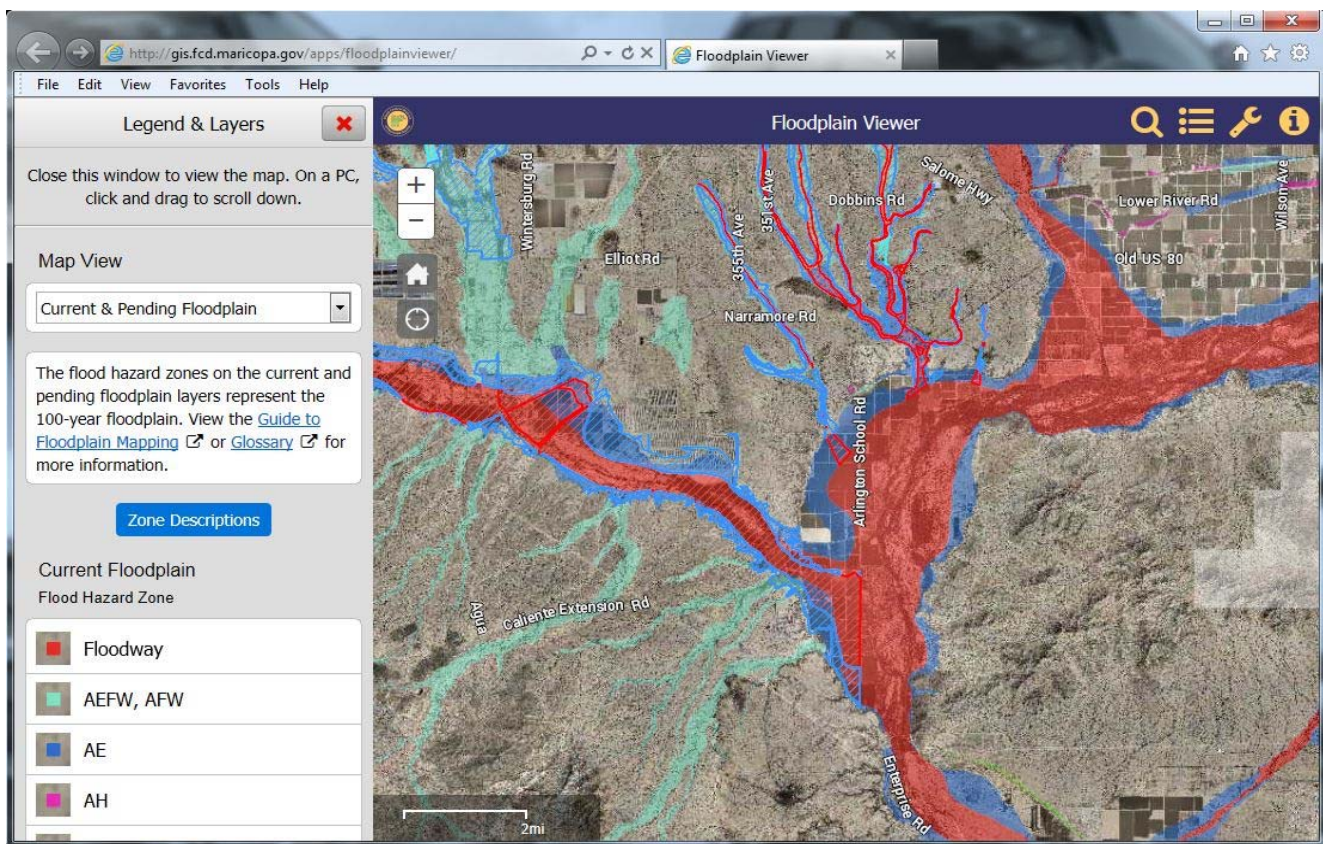
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Am I in a mapped floodplain?

One way to determine your flood risk is to find out if you are in a mapped floodplain. You can view online maps on the FCD's website to determine if your property is located in a 100-year FEMA floodplain at <http://gis.fcd.maricopa.gov/apps/floodplainviewer/>. Please note that areas outside of the mapped floodplain should not be interpreted as having no risk of flooding. These online maps are not official documents and cannot be used for floodplain determination.

Why should I care?

First, knowing if your property is in a mapped floodplain helps determine your flood risk. Second, if your property is in a floodplain, a floodplain use permit may be required when making changes or constructing improvements on your property (see "Do's and Don'ts of Floodplain Uses" section on page 25). Third, if you have a federally-backed mortgage, your lender will require you to purchase flood insurance if your property is within a 100-year floodplain.



You can use the FCD's online Floodplain Viewer to find out if your property is in a floodplain. For an official floodplain determination for your property, contact the FCD or your local jurisdiction's floodplain manager.



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How to request an official floodplain determination

FCD floodplain representatives can help residents determine whether their property is in a floodplain. This free service is available for property owners anywhere within Maricopa County. For residents within communities that conduct their own floodplain management, FCD staff recommends residents also contact their community's floodplain manager for additional information.

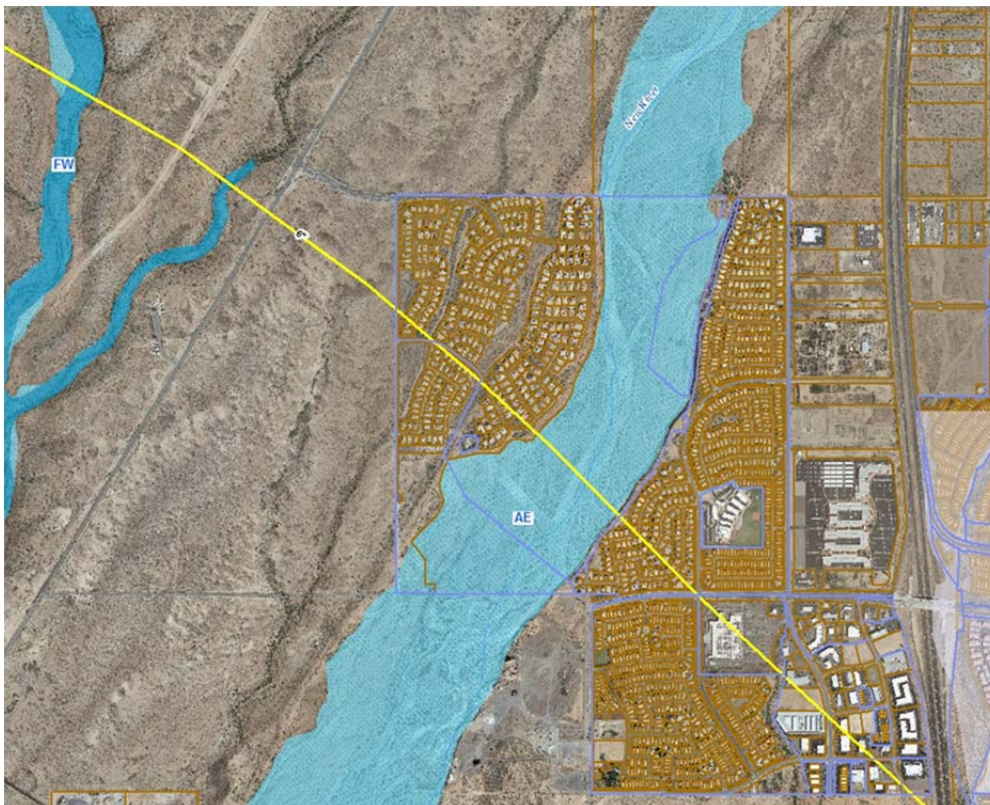
- Call 602-506-2419 and ask for a floodplain representative
- Fill out and return the FCD's Flood Hazard Information Request form at http://fcd.maricopa.gov/downloads/floodplain/FCDMC_FIRM_Form.pdf

For floodplain determinations in the following cities, you can also contact:

Avondale	623-333-4218	Paradise Valley	480-348-3693
Fountain Hills	480-816-5100	Peoria	623-773-7210
Gilbert	480-503-6815	Phoenix	602-262-4960
Glendale	623-930-3656	Scottsdale	480-312-2500
Goodyear	623-882-7979	Tempe	480-350-8288

Additional Sources for Floodplain Information

- If your lot is in a newer subdivision, the final plat for the community may have the 100-year floodplain limits clearly printed on it.
- FEMA floodplain maps can also be obtained by contacting FEMA at 1-800-358-9616.



Example of a floodplain along New River, shown in blue. Often, a floodplain extends for hundreds of feet beyond a wash.



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Challenging or Revising a Floodplain Determination

It may be possible to challenge the determination or make changes to your house or property that could affect the floodplain determination. There are several processes for this depending on whether you believe your property has been incorrectly mapped in the floodplain or if you are planning to make changes to the property that would reduce your flood risk, such as adding fill to elevate planned structures on the property.

If you disagree with the lender's determination that your property is in a floodplain:

- **Request a Flood Hazard Determination Review by FEMA**

FEMA will review the information the lender used and issue a letter stating whether they agree with the lender's determination. Your request to FEMA must be postmarked **no later than 45 days** after the lender notifies you of the flood insurance requirement.

If you believe your property has been incorrectly mapped:

- **Request a Letter of Map Amendment (LOMA)**

If your lot or building site is on natural ground higher than the Base Flood Elevation (BFE) shown on the Flood Insurance Rate Map (FIRM), you may request a Letter of Map Amendment (LOMA) from FEMA. A LOMA verifies that your building or portions of your property have been removed from a designated floodplain. This involves submitting an elevation certificate for your property, which may be available from your local floodplain management office for most newer properties built after 1990. If there isn't a certificate on file you will need to hire a registered land surveyor to prepare one for you. Homeowners located in an A or AO flood hazard zone can prepare their own.

If you have or plan to make changes to your property:

- **Request a Conditional Letter of Map Revision (CLOMR)**

A CLOMR may be requested through FEMA based on the elevation of your structure's finished floor foundation or the level of fill for a new development or substantial improvement. The finished floor elevation must be at least one foot above the Base Flood Elevation (BFE). Elevation certificates to support the CLOMR request may be available at your local floodplain management office. CLOMR applications are available on FEMA's website at www.fema.gov.



Reduce Your Flood Risk

There are many steps individuals can take to reduce their flood risk to their property and themselves. First, know what your flood risk is by reviewing the floodplain maps or by contacting the FCD or your local floodplain administrator. Other steps to take to reduce your flood risk include:

- Purchasing flood insurance.
- Maintaining proper drainage on your property.
- Floodproofing and constructing erosion and other drainage structures.

Flood Insurance

Purchasing flood insurance does not change the chances of your house getting flooded; however, it does reduce your financial risk due to flooding.

Why do I need it?

- Floods are the most common natural disaster in the United States.
- Flood damage is *not* covered by homeowners' insurance policies.
- One in four flood insurance claims nationally are for properties in areas outside the mapped FEMA 100-year floodplains.
- Owners whose property is located in a regulated 100-year floodplain are required to purchase flood insurance if they have a federally-backed mortgage.
- You do not need to live near water to be flooded. Every property in Maricopa County is at some risk of flooding, even those located outside floodplains.
- If you get flooded, don't assume federal disaster assistance or other government funds will help you. Federal disaster assistance is available only if the President declares a disaster. Relief funds are a loan that must be paid back with interest.



Don't wait until a storm is imminent to purchase flood insurance.

What does it cover?

- Flood insurance covers up to \$250,000 for residential properties and \$500,000 for commercial properties for structural damage.
- Contents coverage to replace furnishings and other valuables must be purchased separately and covers up to \$100,000 for homes and up to \$500,000 for businesses.



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How much does it cost?

- Costs for flood insurance vary depending on how much insurance is purchased, what it covers, and the property's flood risk.
- Flood insurance premiums are relatively affordable for homeowners in areas with low to moderate-flood risk– currently less than \$500 per year.
- Flood insurance rates are established nationally through FEMA Flood Insurance Rate Maps. Visit to www.floodsmart.gov to calculate your estimated insurance cost and find an insurance agent.
- The rate for a flood insurance policy will be the same for a particular property regardless of which company issues the policy.

How do I purchase it?

- Flood insurance is available to homeowners, renters and commercial owners/renters.
- You can purchase flood insurance through a licensed property insurance agent.
- There is a 30-day waiting period before a flood insurance policy becomes effective.

For more information regarding flood insurance, visit FEMA's Flood Smart website at www.floodsmart.gov.

Maintenance Responsibilities for Flood Control and Drainage Infrastructure

The Importance of Flood Control and Drainage Structures

While the FCD owns and maintains numerous regional flood control structures throughout Maricopa County, the majority of smaller drainage facilities – such as culverts, ditches and retention basins – are owned by others. Some of these are publicly-owned within a city, county, or state right-of-way (such as along a roadway or freeway), while others are privately owned by homeowners associations (such as community greenbelts used as retention basins) or individual property owners.

These drainage facilities serve an important function in protecting properties against flooding, and also retaining or conveying stormwater throughout a watershed. If these drainage structures are not properly maintained, they can actually cause flooding – rather than reducing or preventing it.

The following information is intended to help private owners and homeowners associations understand their

responsibilities for maintaining proper drainage.



Grates on drainage inlets need to be cleaned of debris before and after storms.



Who is responsible for maintaining drainage facilities in my neighborhood?

It depends on who owns the facilities. Typically your local jurisdiction or homeowners association (HOA) has maintenance responsibilities for drainage in your neighborhood.

- Consult the plat, the grading and drainage plan or the covenants, conditions and restrictions (CC&Rs) for the subdivision. These should outline maintenance responsibilities.
- It is generally the responsibility of the individual property owner to maintain the portion of the drainage channel or wash on his or her property.
- For regional drainage facilities or large washes, the HOA, city or County may be responsible for maintenance.

How do I find out if I have a drainage easement on my property?

- You may be able to obtain a copy of the dedicated drainage easement for most significant washes or channels at the city or County records department.
- In addition, request a copy of the current title report or plat of your lot or subdivision, which will show the location and boundaries of any easements. Plats are available on the Maricopa County Assessor's website at: <http://mcassessor.maricopa.gov> if searching by parcel or the County Recorder's website at <http://recorder.maricopa.gov/internetmaps> if searching by the Recorder's book and page number.

Maintain Drainage

It is important for property owners to maintain proper drainage on their lot when making changes or improvements. This will help them to avoid potential drainage and flooding problems on their property or their neighbor's property.

How do I tell if I have a potential drainage or flooding problem?

If any of the following conditions exist, you could have a flooding or drainage problem that may cause damage to your home:

- Is any part of the house lower than the surrounding ground such that water cannot flow freely away from the house?
- Is there a natural wash (stream, swale, arroyo, or channel) or manmade drainage channel (ditch) on or near your house or property?
- Is there a storm water storage basin on or by your house or property that needs maintenance?



Vegetation and debris deposited by flowing water could indicate a potential drainage or flooding problem.



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- Can roof runoff flow safely away from your house?
- Is your property located within a FEMA-mapped floodplain?
- Is there a dedicated drainage easement on or near your house or property?

How can I determine if any of the above conditions exist on my property?

- Look for evidence of flow (erosion, debris), ponding (overgrown vegetation, water stained walls), or drainage features (grates, drainpipes) on your property.
- Check for high water marks on your house or property.
- Examine the deed and title to your property for disclosures and restrictions.
- Check the recorded plat for your subdivision or lot for Tracts and Drainage Easements and read their descriptions to understand their purpose and their maintenance responsibility.
- Check the FEMA flood insurance rate maps for major floodplain locations.
- Use your local municipality's website or Records Department to view regulations, maps, aerial photos, records and plans.
- Review the seller's disclosures regarding any drainage and flooding problems on the property.



Water ponds against the fence of a home in north Scottsdale after a storm.

Wash or Drainage Easements

If you have a wash or drainage easements running through your property, local stormwater ordinances require you to conduct regular maintenance to maintain the free flow of water in the channel.

If You Have a Wash or Stream on Your Property

- Avoid crossing washes with walls or fences. Stop walls at the edge of the drainage easement or the channel's floodplain and leave the wash area as common open



Avoid encroaching into the active wash channel.



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space.

- Avoid crossing washes with your primary access or the only driveway to your house if possible.
- Avoid diverting natural washes from their natural flow path. Local floodplain and stormwater ordinances require that runoff should enter and depart from a property in substantially the same manner as under pre-development conditions.
- If you must divert flow within your lot, avoid designing channels that turn the water flow more than 45 degrees.
- You must not alter a watercourse without approval from your local jurisdiction and certification from a professional engineer that any alterations will not increase flood levels or hazards within, upstream or downstream from the altered portion of the watercourse.
- Do not store hazardous materials or other large debris in or near the wash or floodplain.



Don't store hazardous materials or debris near or in a wash or floodplain.

If I am responsible for maintenance, what should I do?

Maintenance responsibilities for a wash or drainage easement running through your property consist primarily of keeping it free of obstructions to maintain the free flow of water in the wash or channel. Remove trash, debris, sediment, clogging vegetation, obstructions or structures.

- Washes must not be filled in, plugged, blocked, diverted or altered in any way.
- Trim trees and large shrubs so that limbs are three feet above the bottom of the wash.
- Before removing or trimming vegetation, check to make sure that birds are not nesting in it. In Maricopa County, the nesting season is generally between February and August. Destroying an active nest is a violation of a federal law for most bird species in Arizona.
- Do not remove vegetation that is actively growing on a stream bank. Vegetation in or



Owners are responsible for maintaining washes on their property. Keep washes clear of obstructions to maintain the flow of water, but don't remove vegetation growing along banks.



Reduce Your Flood Risk: A Resource Guide

along a wash may be highly regulated by local, state and federal regulations. Bank vegetation may also provide a level of protection from erosion.

- Invasive species should generally be removed. A list of invasive plants can be obtained at www.scottsdaleaz.gov/Assets/Public+Website/bldgresources/invasiveweeds.pdf
- Do not dump or throw anything into washes, ditches or streams. Check and clean grates and inlets on culverts and other inlet structures before the start of each rainy season (May and October), and after large storms.

Block Walls and Fences

Block walls and fences can create some of the most serious flooding problems if not installed with proper drainage in mind. Walls or fences should not encroach into any drainage easement.

- Avoid constructing walls or fences across any channel or wash.
- If you must cross a wash with a block wall or fence, you should maintain a clear, open span over the wash. If it can't be left open an inclined trash rack should be used to trap debris on the upstream side. Check with your local municipality for design requirements.
- Construct weep holes with a large opening; small openings easily catch debris and clog, causing water to pond or divert. This can result in destruction of the wall, and flooding of the property.
- A floodplain use permit will be needed to construct a wall, or any structure, into or across a drainage easement within a floodplain.



Wall damaged by flooding.

Driveways

- Driveways must not block or divert storm water flow.
- Driveways should not be put across roadside ditches without dipping them or installing a properly-sized culvert.

Constructing Drainage Features

You may want to consider constructing a drainage feature such as a small channel or swale to direct the flows away from your house. Generally, flows must leave your property at the same location it would before the drainage feature was constructed. This would require permits and a registered engineer would need to design the drainage feature to ensure it was the appropriate size and location.



On-Lot Retention

Why does my yard have a depression or a berm around it?

On large properties, some properties have on-lot retention through berms or grading of the lot that was required as part of their original building permit. The purpose of this is to collect and retain runoff from the roof, driveways and the lot itself as required by the local ordinance. This was a common practice in older subdivisions, and today on some large individual lots. The CC&Rs for your subdivision or recorded plat should contain information on any on-lot retention requirements.

Do I have to keep the depression in my yard or can I fill it in?

In the process of landscaping or re-landscaping your yard, the storage capacity of any depressed areas designed to retain stormwater runoff must be maintained. If filled in, runoff from your lot may end up in your house or pool, your neighbor's yard, or overload downstream drainage facilities.

Flood Risk Prevention Tips

Other options to reduce flood risk for individual property owners include floodproofing their house, installing erosion protection, and installing drainage features. Depending on the scale and complexity of the action, property owners may want to consider hiring an engineer to determine the best and most cost-effective solutions for their specific situation. Also, many of these actions require a permit from Maricopa County or the local municipality.

To reduce the potential for floodwater to damage your home, you can implement several flood proofing options. Before considering flood proofing options, homeowners need to contact their local municipality or Maricopa County to determine the types of permits required for the proposed improvements.

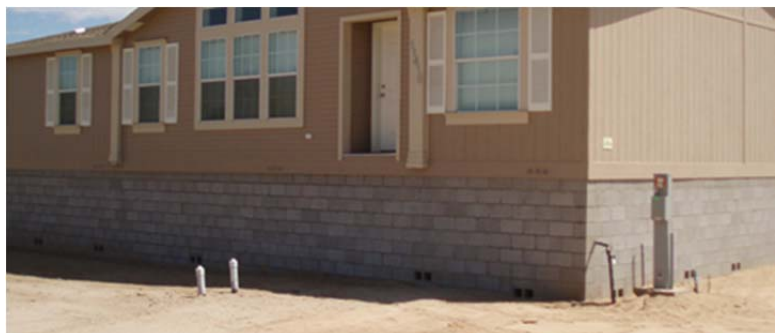
Flood Proofing Your Property

Dry Flood Proofing Measures

- **Waterproof Sealants, Watertight Doors and Window Shields**
Applying waterproof membranes or other sealants to the exterior of your house, as well as installing watertight shields for doors and windows, can prevent water from damaging your home's interior.
- **Flood Walls**
Constructing an exterior floodwall around the perimeter of your house can act as a barrier to prevent flood water from entering a house. The



Short flood walls can act as a barrier to help prevent stormwater from reaching your home.



It's possible to elevate your home's foundation above the estimated elevation of a base flood to protect it.



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floodwall should be watertight and should not exceed 3 feet in height. Watertight access doors need to be installed in openings in the floodwall wherever doors are located around the home.

- **Elevating Your Home**

Elevating your home so the finished floor elevation is above the predicted water surface height for a major flood event is an effective – yet relatively expensive – flood proofing measure. Consider that the cost of damages from a single flood can outweigh the cost of elevating a home. Hiring a qualified, experienced contractor and acquiring building permits are necessary if considering this option.

Wet Flood Proofing Measures

- **Elevating Appliances**

Homeowners can prevent costly damage to appliances – such as their air conditioners, heaters, and water heaters – by elevating them above the predicted flood water level.

Erosion Protection

If the foundation of your house or property is next to a wash or river channel, you may want to install erosion protection to prevent the bank of the wash from eroding and potentially causing damage. Depending on the severity of the erosion, you should consider hiring an engineer (See “Hiring an Engineer” on page 18) to develop a solution for the erosion problem. Check with the local municipality or the County to determine the need for permits.



It's important to excavate before placing rip-rap, gravel or other landscaping material.

Do I need to over-excavate when installing gravel or river rock material in any wash, channel or roadside ditch?

The answer is definitely. Make sure that river rock or any channel lining is “inlaid.” When installing gravel or river rock lining material, you must first excavate to the depth of the material you are installing and then inlay the material.

Do not place material on top of the swale bottom, wash bed, retention basin or channel bottom. Don't dump or place fill material, landscaping gravel, or rip-rap material on top of the ground, bottom or sides of the drainage facility without first excavating.

If you don't over-excavate before placing landscaping or lining material in a drainage facility, water may not be able to enter the channel. At a minimum, the capacity of the channel or basin will be reduced. This can cause the drainage facility to overflow, and divert or back water upstream.



Reduce Your Flood Risk: A Resource Guide

Hiring an Engineer to Evaluate Drainage or Flooding Issues

If the drainage problems you are experiencing are complex or the measures for effective mitigation of flooding hazards on your property are beyond the recommendations contained in this resource guide, you may want to consider hiring an engineer to assist with resolving those issues. Here are some helpful tips to hire an engineer:

- If you choose to start your engineer search online, some useful keywords are 'drainage,' 'hydrology,' 'hydraulics,' 'erosion,' 'water resources,' 'floodplain,' and 'flood control.'
- Check the Arizona State Board of Technical Registration website to confirm that the engineer you are considering hiring is an active registered Professional Engineer (PE). You can also check for complaints or disciplinary actions against an individual through Board's website at <https://btr.az.gov/>.
- After identifying an engineer, a good first step is to arrange for an on-site visit so the engineer can see the problem area in person and hear firsthand from you about the flooding and/or drainage problems you are experiencing. You can expect to pay the engineer an initial retainer fee for this site visit based on their hourly billing rate.
- If the engineer indicates they can assist you in resolving your problem based on the outcome of the site visit, ask for a written proposal that includes the scope of services to be provided, clearly defines the work product to be delivered, outlines a work schedule, and provides a fee estimate for the services to be rendered.
- To the extent possible, confirm that the engineer you intend to hire is well-versed in FEMA floodplain regulations, environmental permitting policies, and current drainage ordinances of the governmental jurisdiction in where your property is located.
- Ask the engineer about other similar projects they have recently completed. Follow up with any references provided.
- Consider soliciting proposals from two or three engineers for comparison of their qualifications and the recommended approach to resolving your drainage-related problems. It's not always best to select an engineer solely on the basis of cost. Be sure you are satisfied with the answers to all of your questions before you decide to sign an engineering services contract.

Flood Hazard Modeling Data Available Online

Hydrologic and hydraulic modeling results for FCD studies are available on our website at: www.fcd.maricopa.gov.



Flood Safety – Protecting Yourself and Your Property

Here are some steps you can take to prepare for a flood and protect yourself and family members.

Before a Flood

- Purchase flood insurance (a 30-day waiting period applies).
- Consider implementing flood proofing measures, such as elevating electrical equipment and major appliances that are susceptible to flooding. (See page 12 for more information).
- Evaluate and correct any drainage issues on your lot.
- Clear obstructions from any stormwater systems, such as pipes, ditches, culverts, washes, that carry runoff on or near your property.
- Build an emergency kit and make a family communication plan that includes a meeting spot in case you're separated.
- Don't forget medicines and special needs required by family members.
- Remember your animals and their needs.
- Protect your home's entrance and back door with sandbags, which may be available from your local fire department, city or town offices.

During a Flood

- Be aware of all media notifications. Monitor social media, local government notices, online rain gage maps, and weather sites.
- Be aware that flash flooding can happen with little or no notice. If this happens, move immediately to higher ground.
- Be aware of streams, drainage channels, canyons, washes and other areas known to flood suddenly.
- Do not drive into flooded areas.
- Be prepared to evacuate your home.



Flash floods move quickly – move to higher ground.

After a Flood

- Avoid floodwaters; water may be contaminated by oil, gasoline or raw sewage. Water may also be electrically charged from underground or downed power lines.
- Be aware of areas where floodwaters have receded.
- Avoid damaged roadways and be cautious of debris and road obstructions.
- Return home only when authorities indicate it is safe.

Emergency Information

- For flood watch/warnings and flash flood watch/warnings tune into local TV or radio stations or the local NOAA Weather Radio in the Phoenix area – KEC 94 at 162.550.



Roadway Safety: Turn Around, Don't Drown!

- DON'T drive or walk through flooded roads or moving water. Six inches of moving water can make you fall and two feet or less of water will cause most vehicles to float.
- Be especially cautious at night when flood dangers are harder to see.
- Be aware that the road may be washed out, so flood waters may be much deeper than expected.
- DON'T drive around barricades; they are there for your protection.
- Stick to designated evacuation routes.



NEVER attempt to cross a flooded roadway or crossing.



Two feet or less of water can sweep away most vehicles.





Managing Flood Risk in Your Community

Roles and Responsibilities of Floodplain Management

Stormwater and floodplain management protects the health and welfare of the public from the impacts of flooding. This is accomplished by identifying flood hazard areas, controlling activities in a floodplain, and developing and maintaining cost-effective and efficient drainage and flood control systems. Federal, state and local agencies and municipalities – as well as property owners – all have a role in this process.

Federal

The Federal Emergency Management Agency (FEMA):

- Sets national policy for floodplain regulations and establishes minimum regulatory requirements for flood hazards.
- Administers the National Flood Insurance Program (NFIP) which subsidizes flood insurance rates and provides federal disaster relief to participating communities affected by flooding.
- Identifies and maps flood hazards on Flood Insurance Rate Maps (FIRM) and helps review and adopt new data and maps.
- Assesses community compliance with the minimum NFIP criteria and advises local officials responsible for administering the ordinance to ensure compliance.

State of Arizona

- Sets state standards for floodplain management.
- Administers the Community Assistance Program and Map Modernization Program.
- Assists communities that participate in the NFIP.
- Works with local, state and federal entities during times of flood emergencies.

County

- Conducts studies to identify flood hazards and risks and potential flood mitigation options for all of Maricopa County.
- Provides flood education and information programs.
- Assists in developing floodplain maps.
- Operates and maintains regional flood control structures, such as dams, levees and channels.
- Performs floodplain management and regulation for 14 local jurisdictions.

Local Municipalities

- Create land use plans that enable and regulate land development.
- Determine whether proposed developments are located in flood hazard areas.
- Require new subdivisions with more than 50 lots to identify flood elevations.
- Review residential subdivision, commercial and industrial plans; issue permits and inspect for compliance.
- Assist in the preparation of floodplain maps.

Property Owners and Homeowners' Associations

- Maintain drainage facilities and washes on private property, as well as proper site drainage.
- Seek the appropriate permits to build in floodplains.



Managing Local Floodplains

Floodplain Management Ordinances and Plans

Both the FCD and local municipalities have a role in managing floodplains to control activities that occur in flood-prone areas and reduce property flooding and damages to residents. Floodplains are managed through the adoption of local Floodplain Management Ordinances and Plans, which include: mapping of the Special Flood Hazard Areas (floodplains) within a jurisdiction's boundaries, establishing development requirements for projects within floodplains, reviewing and approving permits for proposed uses within the floodplain and enforcing floodplain violations. The FCD conducts floodplain management and permitting for the unincorporated areas of Maricopa County and 14 incorporated cities and towns, while 10 cities conduct their own floodplain management (see list to the right).

Local municipalities that participate in the National Flood Insurance Program (NFIP) through FEMA must adopt Floodplain Management Ordinances and Plans. Compliance with community floodplain management plans is a requirement for participation in the NFIP and ensures property owners can purchase flood insurance. Participating communities are also eligible to receive disaster relief for damages from a major storm event.



Managing development in a floodplain is one way the FCD and its municipal partners help minimize potential flooding impacts to residents during large storms.

Who is Responsible for Floodplain Management in My Area?

The FCD conducts floodplain management and permitting for the unincorporated areas of Maricopa County and the following incorporated cities and towns:

- Buckeye
- Carefree
- Cave Creek
- Chandler
- El Mirage
- Gila Bend
- Guadalupe
- Litchfield Park
- Mesa
- Queen Creek
- Surprise
- Tolleson
- Wickenburg
- Youngtown

The following cities conduct their own floodplain management and floodplain use permitting:

- Avondale
- Fountain Hills
- Gilbert
- Glendale
- Goodyear
- Paradise Valley
- Peoria
- Phoenix
- Scottsdale
- Tempe



Regulating Development and Property Improvements in a Floodplain

Why It's Important

Changes in the watershed can affect drainage and flooding on other properties within that watershed. To minimize the impacts from future development and help protect existing and future residents from flooding caused by other property owners, new development or improvements to existing properties in floodplains is controlled through local regulations.

The Floodplain Regulations for Maricopa County define the rules for development restrictions and permitting requirements necessary to protect the environmental and flood control qualities of floodplains. Developers and other private property owners *are not* prevented from building and making improvements on property in a floodplain. However, there *are* special requirements for doing so to ensure stormwater runoff doesn't negatively impact the community.



Property owners in a floodplain are not prohibited from building or making improvements to their property, but there are restrictions for doing so to help avoid potential damage to structures or adverse impacts to adjacent properties.



Potential Impacts of Development and Other Activities in the Floodplain

Rapid population growth in Maricopa County has expanded the urbanized area through residential and commercial development. Changes in land uses can alter the floodplain and the dynamics of storm water flow, increasing the potential for buildings and infrastructure to be damaged by periodic flooding. As urban development increases, so does the potential for stormwater flooding, if not properly managed or regulated.

Urbanization can affect the runoff of stormwater as buildings, parking lots and sidewalks replace the natural vegetation that previously absorbed water. Local stormwater retention requirements and other development regulations are in place to help minimize this increased runoff from developed areas.

Impacts of Development on Flood Risk Upstream

In times of flood, a river or wash flows not only through its normal channel but also along the adjacent floodplain. Any constriction of the natural flow path can 'back-up' the wash and lead to increased flood levels upstream. The construction of homes or other buildings in a floodplain can not only put the development at risk of flooding, but can also increase the flood risk for properties upstream. The same is true of any construction in, or encroachment into, a river or wash channel.

Impacts of Development on Flood Risk Downstream

Natural or agricultural land is normally able to absorb a considerable portion of any rainfall. Covering such land with buildings, pavement for roads and parking lots, or other impermeable materials, significantly reduces this ability to absorb rainfall, and leads to increased stormwater runoff. As a result, large developments, including those away from rivers and washes, can increase flows and the risk of flooding to land and property downstream. A number of smaller developments built up over time can have the same effect.



Pavement and structures on developed land affect how stormwater flows and soaks into the ground.



Do's & Don'ts of Floodplain Uses

What are the building restrictions in a floodplain?

The Flood Control District (FCD) and local municipalities responsible for floodplain management enforce floodplain regulations, which regulate the location and construction of buildings and other development within designated floodplains. This helps prevent new structures or improvements in the floodplain from causing adverse impacts to other properties upstream or downstream.

- Finished floor elevation – The lowest floor in any habitable structure must be elevated at least one foot above the base flood water surface elevation.
- Materials – Construction materials below the regulatory floodplain must consist of flood-resistant materials.
- Erosion hazard setback – Improvements must be located a safe distance from any regulatory wash. The setback increases with the size of the base flood.
- Safe Access – Safe access for standard vehicles must be provided to every lot in a subdivision.
- Fencing – Flows cannot be obstructed by fencing within floodprone areas.
- Mobile homes – Manufactured homes have special requirements, such as anchoring.
- Permitting – All structures, walls, fences, grading or earth-moving activities within the floodplain require review and approval by the FCD or the local municipality responsible for floodplain management.



When do I need a permit?

Before any grading or structural work is done on your property or if the improvement is being done within a public right-of-way or drainage easement, a permit will be required. Depending on the nature of the work and whether the property is located within a floodplain, multiple permits may be needed. Building permits are issued by the local jurisdiction where the property is located.

New development or improvements to a property located in a floodplain require a floodplain use permit, in addition to any building permits issued by the local jurisdiction.

If your property is located within a floodplain, you must acquire a floodplain use permit to make any changes to your property, including:

- Building a new structure or improving an existing structure.
- Installing any type of wall or fencing or other man-made improvements, such as a pool.
- Grading, filling or extracting material.
- Installing drainage improvements, such as berms, ditches or other alterations that have the potential to divert, obstruct or limit flow.
- Excavating material from a wash for any reason, including removing sediment deposited during a flood event.



Reduce Your Flood Risk: A Resource Guide

- Reconstructing eroded channel banks, or constructing erosion protection along existing channel banks.
- Conducting any work within the regulatory floodplain that may divert, obstruct or limit flow.

If a structure on your property was damaged, a permit may be required to repair the damaged structure. Consult with the FCD or your local municipality prior to beginning any repairs. Work within a wash may require approval from the US Army Corps of Engineers. Contact the Regulatory Branch at 202-761-5903 or www.usace.army.mil/Contact.aspx.

What home improvements can I make without a permit?

Minor activities, such as clean-up of deposited vegetative or flood debris, clean-up of fine sediment in the wash overbank, reconstruction of at-grade driveways, or minor modifications to deposited sediment may occur without permits, although consultation with the FCD or municipality is recommended. Unauthorized work not only has the potential to adversely impact your neighbors and create a liability to you, but may also increase the hazard to you and your own property if done improperly.

Obtaining Permits and Inspections

The FCD issues floodplain use permits and conducts inspections for unincorporated County and for 14 incorporated cities and towns (see list on page 22). Other communities in Maricopa County perform their own floodplain management activities and permitting. Depending on where your property is located, you will follow one of three permitting scenarios below when obtaining a permit to develop or improve a property in a floodplain.

1. **If your property is located in unincorporated Maricopa County**, visit the One-Stop-Shop to start the permitting process, a central location where the partner agencies that issue permits are routed a copy of the application for review. An application is available at www.maricopa.gov/planning and at 501 N. 44th St., Ste. 200, Phoenix, AZ 85008, 602-506-3301.
2. **If your property is located in a community that conducts its own floodplain management**, building and floodplain use permits are processed by the respective community and a permit from the County is not needed.
3. **If your property is located in a community in which the FCD handles the floodplain management**, visit the appropriate city/town location to start the permitting process. If your property is in a floodplain, you will also need to obtain a floodplain use permit from the Flood Control District.

What are the restrictions for building on a flood-prone lot?

New, livable structures are not allowed in the floodway portion of a mapped floodplain. Some types of improvements, such as shade structures, fencing, and cellular towers, are allowed if an engineer can demonstrate that the improvement does not raise the water surface elevation. Construction in a floodplain is allowed with restrictions. (See the definitions of floodplains and floodways on page 6.)

More Information

For more information, download the Floodplain Regulations for Maricopa County at http://fcd.maricopa.gov/downloads/permitting/floodplain_reg_book.pdf



Floodplain Violations - Enforcement and Reporting

Reporting Floodplain Violations

If a neighbor is blocking or altering a wash or re-grading, excavating, or dumping material in a regulatory floodplain without a permit, it may cause adverse impacts to adjacent properties and constitute a violation of the local Floodplain Ordinance. A floodplain violation is any unauthorized structure, fill or other development within a delineated floodplain. A violation occurs when any unpermitted activity diverts, obstructs, impedes or otherwise changes the regulatory floodplain and creates a hazard to life or property.

Complaints of potential floodplain violations should be reported to the FCD (if within unincorporated areas of Maricopa County) or to your local municipality's floodplain administrator for investigation. Anyone making a complaint may do so anonymously.

If the problem is on a regulatory wash, and you think it may be a violation of the floodplain ordinance:

- Call the Flood Control District or your community's floodplain manager.
- Document the activity.
 - Note the time, date and exact location.
 - Take pictures, draw maps, write down license plate numbers and descriptions of vehicles.
 - Obtain the property address or legal description.

The information you provide helps us to resolve your complaint faster. Once a possible violation has been reported, an inspector will review the area. If a violation has occurred, the property owner or involved party in question will be formally notified and requested to take corrective action. Civil court action has been required in some instances.

Who To Call In Your Area

Unincorporated Maricopa County (Flood Control District)

Floodplain Violations	602-506-2419
Drainage Complaints	602-506-3301

Avondale	623-333-4218
Fountain Hills	480-816-5100
Gilbert	480-503-6815
Glendale	623-930-3656
Goodyear	623-882-7979
Paradise Valley	480-348-3693
Peoria	623-773-7210
Phoenix	602-262-6441
Scottsdale	480-312-2500
Tempe	480-350-8288

Residents of all other municipalities should contact the FCD to report drainage complaints and floodplain violations.



Sources

Information in this resource guide was compiled from multiple sources. These sources are listed below.

Helpful Resources

- *2014 Flood Facts* (Flood Control District of Maricopa County)
- *Homeowners Guide to Drainage* (City of Scottsdale)
(<http://www.scottsdaleaz.gov/Assets/Public+Website/traffic/drainageguide.pdf>)
- *City of Phoenix 2014 Seamless Service Directory*
(<https://www.phoenix.gov/piosite/Documents/047076.pdf>)

How Flood Risk is Determined

- *2014 Flood Facts* (Flood Control District of Maricopa County)
- *Definitions of FEMA Flood Zone Designations*, CoreLogic

Floodplain Information Sources

- *Homeowners Guide to Drainage* (City of Scottsdale)
(<http://www.scottsdaleaz.gov/Assets/Public+Website/traffic/drainageguide.pdf>)
- <http://gis.fcd.maricopa.gov/apps/floodplainviewer>
- <http://fcd.maricopa.gov/faq.aspx>

Challenging or Revising a Floodplain Determination

- <http://fcd.maricopa.gov/faq.aspx>
- <http://www.fema.gov/national-flood-insurance-program-flood-hazard-mapping/mt-2-application-forms-and-instructions>

Maintaining Proper Drainage on Your Lot

- City of Scottsdale *Homeowners Guide to Drainage*
(<http://www.scottsdaleaz.gov/Assets/Public+Website/traffic/drainageguide.pdf>)

Flood Insurance

- *2014 Flood Facts* (Flood Control District of Maricopa County)
- www.floodsmart.gov

Floodproofing

- *Mitigation Ideas for Reducing Flood Loss* (FEMA publication October 2010;
http://www.fema.gov/media-library-data/20130726-1756-25045-1786/protecting_home_book_508compliant.pdf)

Flood Safety

- *2014 Flood Facts* (Flood Control District of Maricopa County)

Managing Local Floodplains

- <http://fcd.maricopa.gov/faq.aspx>

Impacts of Development and Other Activities in the Floodplain

- <http://www.flooding.ie/Planning/Floodriskanddevelopment/>



Reduce Your Flood Risk: A Resource Guide

Regulating Development and Improvements in a Floodplain

- <http://fcd.maricopa.gov/faq.aspx>
- http://fcd.maricopa.gov/downloads/permitting/floodplain_reg_book.pdf
- <http://www.usace.army.mil/>

Floodplain Violations – Enforcement and Reporting

- http://fcd.maricopa.gov/downloads/permitting/floodplain_reg_book.pdf

Maintenance Responsibilities for Flood Control and Drainage Infrastructure

- *Homeowners Guide to Drainage* (City of Scottsdale)
(<http://www.scottsdaleaz.gov/Assets/Public+Website/traffic/drainageguide.pdf>)
- <http://fcd.maricopa.gov/downloads/Flood-Responsibility-Graphic.pdf>

Wash Maintenance

- <http://fcd.maricopa.gov/downloads/Flood-Responsibility-Graphic.pdf>
- City of Scottsdale *Homeowners Guide to Drainage*
(<http://www.scottsdaleaz.gov/Assets/Public+Website/traffic/drainageguide.pdf>)
- *Balancing Nature and Safety: A Homeowners Guide to Wash Ownership and Maintenance* (City of Scottsdale)
(<http://www.scottsdaleaz.gov/Assets/Public+Website/Stormwater+Management/Wash+Maintenance+Brochure.pdf>)